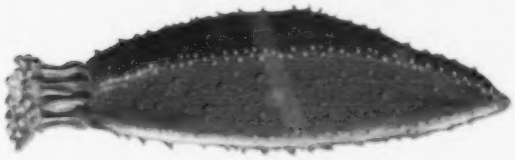
Fisheries and Oceans Canada | Pêches et Océans Canada
Ecosystems and Oceans Science | Sciences des écosystèmes et des océans

Newfoundland and Labrador Region

Canadian Science Advisory Secretariat
Science Advisory Report 2017/029

AN ASSESSMENT OF THE SEA CUCUMBER (*CUCUMARIA FRONDOSA*) RESOURCE ON THE ST. PIERRE BANK (NAFO SUBDIVISION 3PS) IN 2016



Sea Cucumber (Cucumaria frondosa)

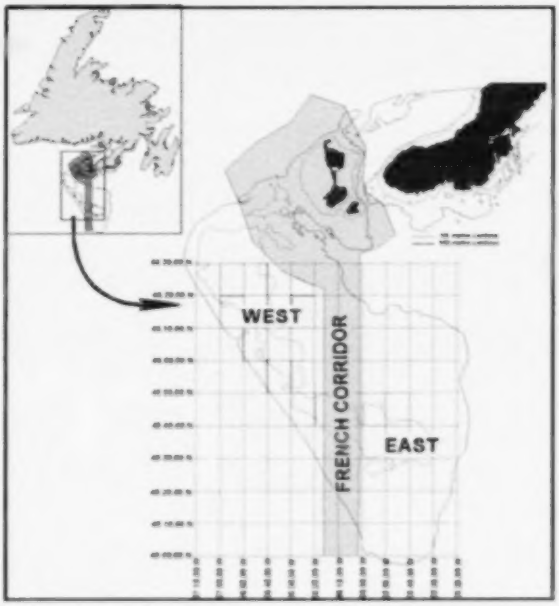


Figure 1: Map showing Sea Cucumber areas on the St. Pierre Bank.

Context :

The Sea Cucumber (Cucumaria frondosa) has been reported almost circumpolar in the northern hemisphere. Populations off Newfoundland and Labrador are normally found in waters down to 100 m, usually on hard bottom with a cobble-shell-boulder substrate composition.

In 2003, a Sea Cucumber drag fishery, under the umbrella of the New Emerging Fisheries Policy, was established on the St. Pierre Bank with eight participants sharing a total allocation of 454 t. As part of the emerging fisheries policy, the same eight fishers entered into a five year Joint Project Agreement (JPA) with Fisheries and Oceans Canada (DFO) to conduct a resource assessment survey which took place from 2004 to 2008. A Canadian research survey on St. Pierre Bank was carried out in September 2016, which covered all of the southeast area, but only covered 23% of the northwest area.

There are two main Sea Cucumber concentrations on the Canadian portion of the St. Pierre Bank, one northwest and one southeast of the French Economic Zone. In 2010, the southeastern area was closed to fishing as a conservation measure to preserve the resource in this area until the effects of fishing could be evaluated. The fishery has focused primarily on the northwestern portion of the resource distribution. The allocation has increased over time to 2,242 t in 2013, where it has remained.

The last peer Regional Peer Review Meeting to assess the status of Sea Cucumber took place in

April 2009. This Science Advisory Report is from the February 21, 2017 Regional Peer Review Meeting on the Assessment of Sea Cucumber in the Northwest Atlantic Fisheries Organization (NAFO) Subdivision 3Ps. Additional publications from this meeting will be posted on the Fisheries and Oceans Canada (DFO) Science Advisory Schedule as they become available.

SUMMARY

- The fishery was initiated in 2003 with an allocation of 454 t. This allocation was gradually increased to 2,242 t in 2013, where it has remained. The **landings** averaged approximately 1,200 t since 2010 with the highest catch in 2015 at 2,297 t.
- The catch per unit effort (**CPUE**) increased in the beginning of the fishery from 2003 to 2008 and has remained stable since 2009 with a mean CPUE of 597 kg/tow.
- The **biomass index** based on the emerging cucumber fishery survey from 2004 to 2008 (excluding 2005) averaged 89 kt in the northwest area and 210 kt in the southeast area. The 2005 estimate is not considered reliable due to gear configuration issues.
- In 2016, the cucumber survey biomass index was 187 kt in the southeast area, and the survey in the northwest area was incomplete in 2016. The abundance in 2016 in the southeast area was above the 2004-08 average.
- Sustainable **exploitation rates** are unknown.
- Given the uncertainties with this species on the St. Pierre Bank, there is no scientific basis for assessing the risk of any increase in harvest level.

BACKGROUND

Biology

Sea Cucumbers are commonly distributed down to 100 m in waters off Newfoundland. They exhibit a 1:1 sex ratio and colonize bedrock, boulder, gravel and sandy habitats. Sea Cucumbers attach to the substrate using tube feet and move little. They are suspension feeders that filter food from the water column. Body wall thickness increases and water content decreases throughout the summer months (Grant et al. 2006).

There is limited information on life history of Sea Cucumber on the St. Pierre Bank. Most of the knowledge on this species in eastern Canada was obtained from studies in the St. Lawrence Estuary. Based on the few studies that have been conducted on Sea Cucumber on St. Pierre Bank (Grant et al. 2006 and So 2009), spawning time occurs from late March to early May on the St. Pierre Bank, which is earlier than in the St. Lawrence Estuary. Size at sexual maturity on the St. Pierre Bank is ~ 9-11 cm (Grant et al. 2006). Growth rates of juveniles and adults are slow with seasonal patterns correlated with food supply (So 2009). Due to the plasticity of Sea Cucumbers, physical characteristics and basic morphometrics such as weight, length and age are difficult to obtain for this species. Length, width and wet weight are all dependant on the water content within the Sea Cucumber. Dry and immersed weights are the most accurate measures of Sea Cucumber size (So 2009).

Solaster endeca, the Purple Sunstar, is the main predator of Sea Cucumber at all life stages. Injured Sea Cucumbers can attract, and are more vulnerable to, scavengers and predators.

The Fishery

In the early 2000s, an initiative to explore the use of experimental towed gear on the St. Pierre Bank was undertaken by Government of Newfoundland's Department of Fisheries and Aquaculture (DFA). In 2002, the modified sea urchin drag from Maine was adopted as the standardized fishing gear to be used in the Sea Cucumber fishery in Newfoundland and Labrador (NL).

In 2003, eight harvesters were given an allocation of 454 t to do reconnaissance on the St. Pierre Bank to investigate potential commercial concentrations of Sea Cucumbers. In 2004, a Sea Cucumber fishery, under the umbrella of the New Emerging Fisheries Policy, was established on the St. Pierre Bank. As a condition of license, all fishers were required to actively participate in the fishery each year and submit detailed fishing logs.

There are two main Sea Cucumber concentrations on the Canadian portion of the St. Pierre Bank, one northwest and one southeast of the French Economic Zone (Fig. 1). The commercial fishery normally takes place between June and September and has focused primarily within the northern portion (area approximately 38 nm^2) of the northwest area of the resource distribution. In 2010, the southeastern area was closed to fishing as a measure to conserve the resource until the effects of fishing could be evaluated.

The allocation has gradually increased from 454 t in 2003 to 612 t in 2005, and currently up to 2,242 t since 2013. The allocation increase in 2005 was to compensate for the fraction of landed weight that was water and debris, estimated to be 30% on average. Gross landings (including water and debris) are the weights recorded against allocation.

ASSESSMENT

Commercial Fishery

The **landings** (Fig. 2) averaged 460 t over the period 2003-06 and declined to 190 t in 2007 due to poor market conditions. The landings averaged approximately 1,200 t since 2010 with the highest catch in 2015 at 2,297 t and approximately 1,600 t in 2016 (*note: 2016 landings are preliminary as they are based on logbooks recorded up to February 2017*).

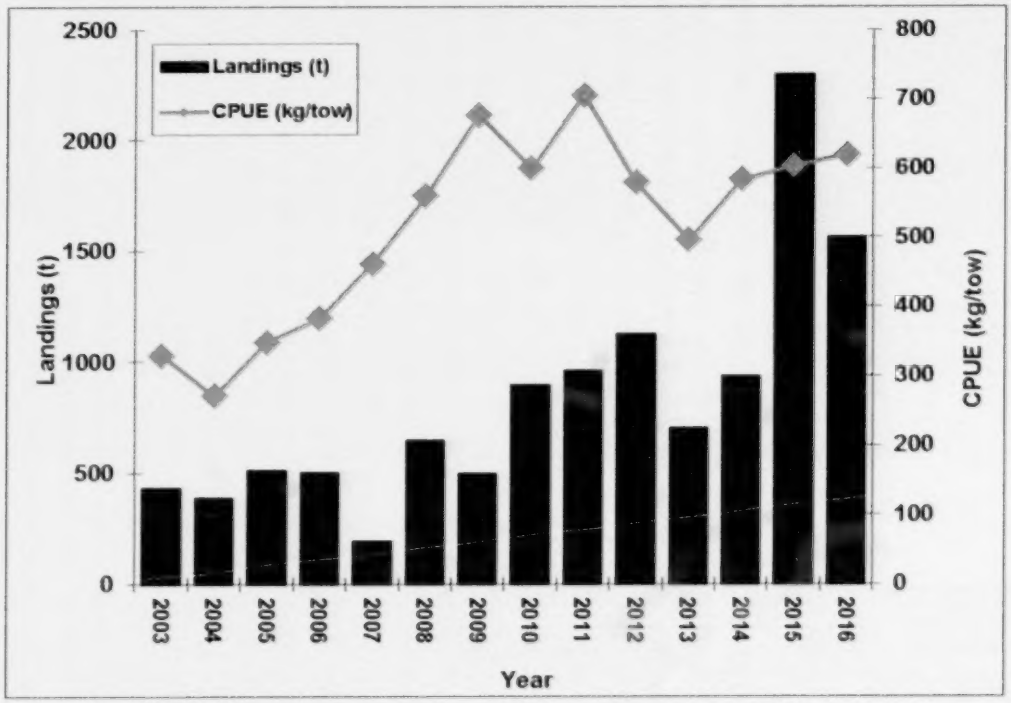


Figure 2: Trends in St. Pierre Bank landings and commercial CPUE (kg/tow) 2003-16.

Commercial catch per unit of effort (**CPUE**) (Fig. 2) increased between 2003 and 2008 and has remained relatively stable since 2009 with a mean CPUE of 597 kg/tow. **CPUE** has been standardized to a half-nautical mile tow.

By-catch in the fishery consists of various species including Toad Crab (*Hyas araneus*), Sea Urchin (*Strongylocentrotus droebachiensis*), Sea Scallop (*Placopectin magellanicus*), Iceland Scallop (*Chlamys islandica*) and some groundfish species including Yellowtail Flounder (*Limanda ferruginea*) and American Plaice (*Hippoglossoides platessoides*).

Biomass

The **biomass index** based on the emerging cucumber fishery survey from 2004 to 2008 (excluding 2005) averaged 89 kt in the northwest area and 210 kt in the southeast area. The 2005 estimate is not considered reliable due to gear configuration issues. No cucumber surveys were completed in the 2009-15 period. In 2016, the cucumber survey biomass index was 187 kt in the southeast area. The survey in the northwest area was incomplete and only covered approximately 23% of this area (strata 13, 16, and 17) where the biomass index was 22,601 t (Fig. 3 and Fig. 4). The abundance in 2016 in the southeast area was above the 2004-08 average.

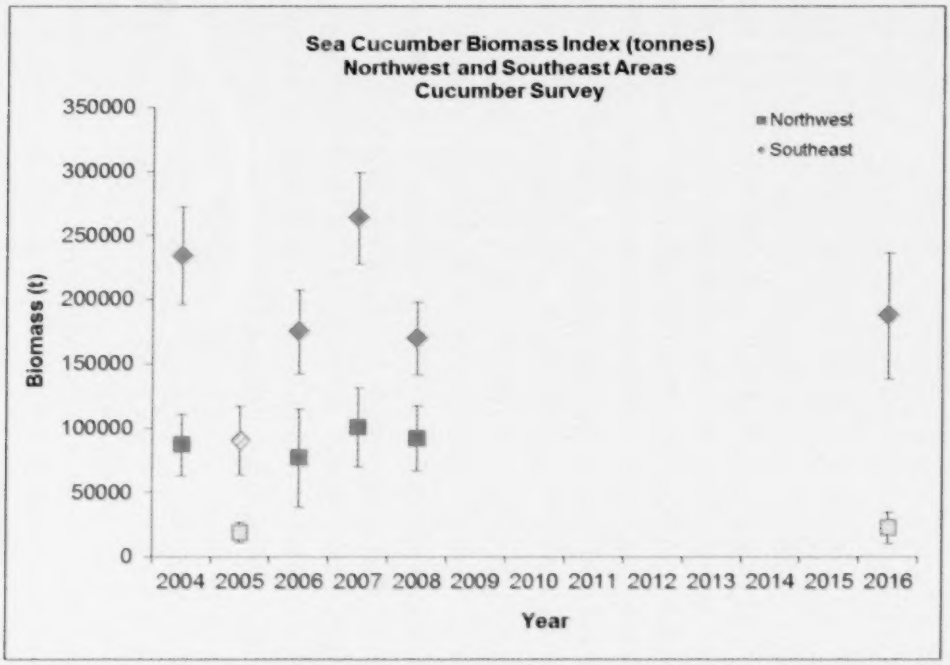


Figure 3: Annual biomass index estimates of Sea Cucumber, southeast and northwest of the French corridor on the St. Pierre Bank (bars indicate 95% CI). Note the 2005 estimate is not considered reliable due to gear configuration issues. In 2016 the cucumber survey in the northwest area only covered strata 13, 16, and 17.

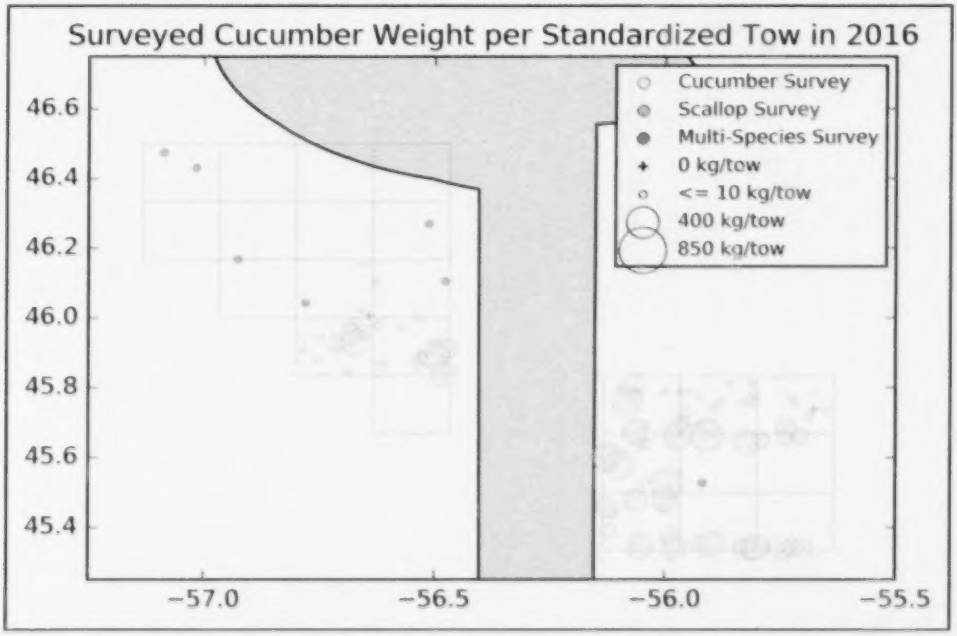


Figure 4: Weight (kg) per standardized tow based on the Sea Cucumber Survey in 2016. Note: In the Northwest area only three strata (23% of the survey area) were surveyed.

Because survey drag efficiency is unknown, but believed to be less than one, the biomass index obtained from the annual survey is considered a minimal biomass index. The index is calculated from fresh wet weight of cucumber at time of capture with no adjustments for drainage or water absorption.

The Sea Cucumber biomass index was also calculated using scallop survey data which covered some of the same strata in the northwest and southeast areas in 2010 and 2015. The biomass index in 2010 was 37 kt in the northwest area and 46 kt in the southeast area; while in 2015 the biomass index was 56 kt in the northwest area and 31 kt in the southeast area. A biomass index for Sea Cucumber was also determined from the 3Ps multispecies spring survey data from 1996 to 2016; however it represented no clear trend. For both the multispecies and scallop surveys catchability for Sea Cucumber as a target species was deemed to be questionable. The gear that is used for the scallop survey is an eight foot New Bedford dredge and for the multispecies survey a Campelen bottom trawl is used which differs from the six foot modified sea urchin dredge that is used commercially to target Sea Cucumber.

During the Sea Cucumber survey in September 2016, up to 50 representative samples of Sea Cucumber were collected and measured (length, weight and girth) based on wet weights from each tow. Based on these samples collected from both the southeast area and a portion of the northwest area (strata 13, 16 and 17), it seems that the Sea Cucumber in the southeast area is comprised of animals that are smaller in size than those occurring in the northwest area (Fig. 5).

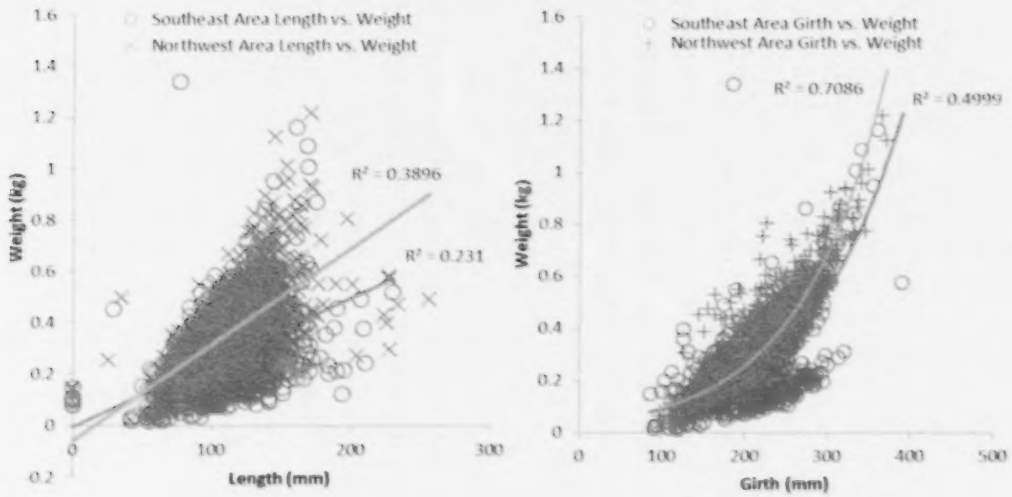


Figure 5: Length (mm) vs. weight (kg) scatter plots (left panel) and girth (mm) vs. weight (kg) scatter plots (right panel) for the northwest and southeast areas based on the Sea Cucumber Survey in 2016.

Mortality

The natural **mortality** rate is unknown. Sustainable **exploitation rates** are unknown.

Sources of Uncertainty

Population structure and sustainable exploitation rates are unknown.

Basic morphometrics such as weight, length and age are difficult to obtain for Sea Cucumber due to the plasticity of their physical characteristics. Length, width and wet weight are all dependent on the water content within the Sea Cucumber. Dry and immersed weights are the most accurate measures of Sea Cucumber size (So 2009).

Age at maturity, recruitment processes, and natural mortality are unknown.

Due to the gear differences between the scallop and multispecies surveys, catchability is questionable for Sea Cucumber as a target species. Therefore any Sea Cucumber biomass index estimates would be unreliable. Survival of discards returned to the water has not been evaluated.

The consequences of harvesting method and removals on ecosystem structure and function are unknown.

The September 2016 3Ps Sea Cucumber survey was incomplete and only 23% of the northwest area was surveyed, therefore the Sea Cucumber biomass index for this area is considered inconclusive.

CONCLUSION

Given the uncertainties with this species on the St. Pierre Bank, there is no scientific basis for assessing the risk of any increase in harvest level. Sustainable exploitation rates are unknown.

Based on the slow growth rates of Sea Cucumber on the St. Pierre Bank and the fact that the most recent survey was incomplete and unreliable in providing a biomass index for the northwest area, it is advised that a relatively low exploitation rate be maintained for this resource.

SOURCES OF INFORMATION

This Science Advisory Report is from the Regional Peer Review Meeting of February 21, 2017 on the Assessment of Sea Cucumber in NAFO Subdivision 3Ps. Additional publications from this meeting will be posted on the Fisheries and Oceans Canada (DFO) Science Advisory Schedule as they become available.

Grant, S.M., Squire, L., and Keats, C. 2006. Biological resource assessment of orange footed cucumber (*Cucumaria frondosa*) occurring on the St. Pierre Bank. Fisheries and Marine Institute Centre for Sustainable Aquatic Resources. Project No. P-137/P-172. 75p.

So, J.J. 2009. Assessment of the biology, ecology and genetic structure of the sea cucumber *Cucumaria frondosa* for management of the fishery in the Newfoundland and Labrador Region. Thesis (M.Sc) Memorial University of Newfoundland, St. John's, NL.

THIS REPORT IS AVAILABLE FROM THE:

Center for Science Advice (CSA)
Newfoundland and Labrador Region
Fisheries and Oceans Canada
PO Box 5667
St. John's, NL A1C 5X1

Telephone: 709-772-3332
E-Mail: DFONLCentreforScienceAdvice@dfo-mpo.gc.ca
Internet address: www.dfo-mpo.gc.ca/csas-sccs/

ISSN 1919-5087
© Her Majesty the Queen in Right of Canada, 2017

Correct Citation for this Publication:

DFO. 2017. An Assessment of the Sea Cucumber (*Cucumaria frondosa*) resource on the St. Pierre Bank (NAFO Subdivision 3Ps) in 2016. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2017/029.

Aussi disponible en français :

MPO. 2017. Une évaluation de l'holothurie (Cucumaria frondosa) sur le banc de Saint-Pierre (sous-division 3Ps de l'OPANO) en 2016. Secr. can. de consult. sci. du MPO, Avis sci. 2017/029.